

-39-
ABSTRACT

A plasma treatment system (10) is provided having an automated, in-line processing ability. The preferred embodiment is directed toward plasma treatment of PC boards (28) but is generally applicable to any substrate susceptible of plasma reaction. The plasma treatment system (10) has the primary components of a reaction chamber (14) and chamber base (16), a chamber lifting assembly (18), a conveyor input assembly (12), a push mechanism (20) and associated linear drive assembly (22), an output assembly (24), an electronic control system (26), and a vacuum and plasma generating system (27). Each of the conveyor input assembly (22), reaction chamber (14), and output assembly (24) include pairs of guide rails (34, 52, and 106, respectively) which are capable of being juxtaposably aligned relative to one another and upon which the PC boards (28) may guideably and sideably travel. The push mechanism 20 effectuates both movement and positioning of the PC boards (28) along the guide rails (34, 52, and 106). To allow placement of the PC boards (28) within the reaction chamber (14) and upon the chamber guide rails (52), the reaction chamber (14) is capable of vertical movement via the chamber lifting assembly (18), the reaction chamber (14) being open-bottomed and vacuum-tightly fittable upon the chamber base (16). Plasma treatment is initiated using conventional plasma generating elements. The push mechanism (20) and guide rail (34, 52, and 106) arrangement provide that multiple PC boards may be properly positioned for simultaneous processing in an in-line fashion. Applied DC biasing (502) is used to increase etch rates and plasma flow directionality. An alternative embodiment (410) incorporates a multi-level guide rail arrangement together with vertically raiseable input and output carriers (110 and 122) to provide that two or more levels of PC boards (28) may be simultaneously treated by plasma reaction. A third embodiment includes supplies for applying Radio Frequency (RF) power (504) and DC bias power (502) to the gas plasma. By using vertical electrodes (598), the plasma can be made to flow horizontally between the layers of a multilevel array or magazine (620) that holds parts that are to be treated.